

What is claimed is:

1. A method for densification of a thermal spray coating comprising:

depositing a thermal spray coating on a substrate; and

5 mixing the thermal spray coating and the substrate by friction stir welding.

2. The method of claim 1, wherein the mixing causes metal flow of the thermal spray coating to a depth controlled by  
10 a nib of a weld tool into the substrate.

3. The method of claim 1, wherein the thermal spray coating is deposited by as a plasma spray.

15 4. The method of claim 1, wherein the thermal spray coating is deposited by oxy-fuel combustion acceleration of a powder feedstock.

5. The method of claim 1, wherein the thermal spray  
20 coating is deposited by two-wire electric arc spray.

6. The method of claim 1, wherein the substrate is a ferrous alloy.

7. The method of claim 1, wherein the substrate is a non-ferrous alloy.

8. The method of claim 1, wherein a thermal spray coating  
5 is a ceramic, a carbide, a metal, a composite, or a plastics.

9. The method of claim 1, further comprising determining  
a time between depositing the thermal spray coating and the  
10 friction stir welding according to a distance between a  
spray gun of a thermal spray system and a tool of a  
friction stir welding system and a speed of the substrate  
relative to the spray gun and tool.

15 10. A system for densification of a thermal spray coating  
comprising:

a first thermal spray gun for depositing a first  
coating on a substrate; and

a densification tool for mixing the coating and the  
20 substrate.

11. The system of claim 10, wherein the densification tool  
is housed in a protective tube.

12. The system of claim 11, wherein the tube is ceramic.

13. The system of claim 10, further comprising a second thermal spray gun.

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14. The system of claim 13, wherein the first thermal spray gun applies the first coating before mixing and the second thermal spray gun applies a second coating after mixing.

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15. The system of claim 10, wherein the first thermal spray gun and the densification tool are fixed relative to one another, and are moveable relative to the substrate.